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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,238	06/25/2003	Naoya Hasegawa	9281/4579	4781

7590 08/05/2005

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EXAMINER	
BERNATZ, KEVIN M	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 08/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/607,238	HASEGAWA ET AL.	
	Examiner	Art Unit	
	Kevin M. Bernatz	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *12 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,19-30,34,35 and 39-42* is/are pending in the application.

4a) Of the above claim(s) *23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16,19-22,24-30,34,35 and 39-42* is/are rejected.

7)☒ Claim(s) *19 and 20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Amendments to claims 1, 2, 5, 6, 13 – 15, 24, 34 and 39 and cancellation of claims 17 and 18, filed on May 12, 2005, have been entered in the above-identified application.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Objections

3. Claims 19 and 20 are objected to because of the following informalities: the base claim from which these claims depend (claim 13) recites that the insulating portion of the current limiting layer possesses a plurality of holes, yet claims 19 and 20 recite that the insulating portion comprises "grooves" (claim 19) or "a hole" and "a groove" (claim 20). The language is inconsistent between the base claim and claims 19 and 20. Appropriate correction is required.

For the purpose of evaluating the prior art, the Examiner has interpreted claims 19 and 20 as "further" having grooves in addition to the holes recited in claims 13. The Examiner notes that this interpretation renders claims 19 and 20 as substantial duplicates and applicants are suggested to cancel one or the other should they amend claims 19 and 20 to positively recite that the insulating layer comprises both holes and grooves.

Claim Rejections - 35 USC § 102

4. Claims 1, 2, 7 – 16, 19 – 22, 24, 26 – 30, 34, 35, 39 and 40 are rejected under 35 U.S.C. 102(a), (b) and/or (e) as being anticipated by Kamiguchi et al. (U.S. Patent No. 6,495,275 B2) for the reasons of record as set forth in Paragraph No. 12 of the Office Action mailed on February 7, 2005.

Regarding the amended language inserted into claims 1, 2, 13, 14, 24 and 34 (i.e. "wherein the insulating portion of the current limiting layer comprises an insulating material film having a plurality of holes extending from a top to a bottom of the current limiting layer, the holes being filled with a conductive material film serving as the conductive portion"), the Examiner notes that this limitations was previously addressed as prior claim 18. However, to clarify the record, the Examiner will further explain why the Examiner deems that Kamiguchi et al. reads on the claim limitation.

Specifically, the Examiner notes that Kamiguchi et al. disclose that the current limiting layer (*e.g. Kamiguchi et al.'s "K-layer", "growth controlling layer", "diffusion preventing layer" and/or "electron reflecting layer", all of which are identical materials but called different names by Kamiguchi et al.*) may be a layer possessing pinholes (*col. 32, line 60 bridging col. 33, line 9*). The Examiner deems that "pinholes" are acknowledged to be "holes extending from a top to a bottom of the current limiting layer" (*see Kamiguchi et al. "need not be configured to uniformly cover the metal buffer layer **4**, but may be configured to include pin holes or to contain the above-mentioned oxides, nitrides, carbides, borides, fluorides, etc. in form of isles or in a discontinuous state"*).

Given that Kamiguchi et al. disclose forming these current limiting layers between *conductive* materials (i.e. the two layers of a synthetic free magnetic layer), the Examiner deems that such a structure would necessarily possess "holes being filled with a conductive material film serving as the conductive portion", i.e. holes being filled with the magnetic material subsequently deposited on the pin hole-filled current limiting layer.

5. Claims 1, 5 - 7, 9, 11, 13, 15, 16, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(a) and/or (e) as being anticipated by Hasegawa et al. (U.S. Patent App. No. 2002/0135956 A1); - **and** –

6. Claims 1, 5 - 7, 9, 11, 13, 15, 16, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(a) as being anticipated by Hasegawa et al. (JP 2003/008108 A). See the provided Derwent Abstract translation for JP '108 A and U.S. Patent App. No. '956 A1 above, which is the English language equivalent to JP '108 A; - **and** –

7. Claims 1, 5 - 7, 9, 11, 13, 15, 16, 22, 24, 25, 27, 29, 34 and 39 – 41 are rejected under 35 U.S.C. 102(f) because the applicant did not invent the claimed subject matter, since Hasegawa et al. has a common assignee, but a different inventive entity than the present application.

The Examiner notes that the above three rejections are maintained for the reasons of record as set forth in Paragraph No.'s 13 – 15 of the Office Action mailed on February 7, 2005.

Regarding the amended language inserted into claims 1, 2, 13, 14, 24 and 34 (i.e. "wherein the insulating portion of the current limiting layer comprises an insulating material film having a plurality of holes extending from a top to a bottom of the current limiting layer, the holes being filled with a conductive material film serving as the conductive portion"), the Examiner notes that this limitations was previously addressed as prior claim 18. However, to clarify the record, the Examiner notes that this limitation is explicitly disclosed in Paragraphs 0105 – 0106 of Hasegawa et al. ('956 A1).

Claim Rejections - 35 USC § 103

8. Claims 1, 2, 7 – 16, 19 – 22, 24, 26 – 30, 34, 35, 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. (U.S. Patent No. 6,495,275 B2) in view of Sugawara (U.S. Patent No. 6,828,039 B2), Sugawara (U.S. Patent App. No. 2004/0052008 A1), and Fujiwara et al. (U.S. Patent App. No. 2002/0054461 A1).

Kamiguchi et al. is relied upon as described above.

While the Examiner maintains that the "pin hole" layer of Kamiguchi et al. will necessarily possess a structure meeting applicants' claimed limitation, the Examiner notes that the prior art recognizes that discontinuous layers used in magnetic detecting elements can be formed by utilizing a structure comprising an insulating portion of the layer comprising an insulating material film having a plurality of holes extending from a top to a bottom of the layer, the holes being filled with a conductive material film serving as the conductive portion" (*Sugawara '039 B2 – Figure 2, elements 18, 22, 24 and 26; Sugawara '008 A1 – Figure 5, elements 57 and 58; and Fujiwara et al. – Figures 2 and*

3a). While the Examiner acknowledges that none of Sugawara '039 B2, Sugawara '008 A1, and Fujiwara et al. explicitly teach using such an insulating + conductive layer in the same structural location as applicants, the Examiner notes that "the test for obviousness is not whether features of the secondary reference may be bodily incorporated into the primary reference's structure, nor whether the claimed invention is expressly suggested in any one or all of the references, rather the test is what the combined teachings would have suggested to those of ordinary skill in the art." *Ex parte Martin* 215 USPQ 543, 544 (PO BdPatApp 1981). In the instant case, since Kamiguchi et al. teach forming a current limiting layer comprising "pin holes" or a discontinuous layer in a position meeting applicants' claimed structural limitations and the prior art references of Sugawara '039 B2, Sugawara '008 A1, and Fujiwara et al. teach that discontinuous layers used in magnetic detecting elements can comprise insulating layers with holes filled with conductive material to better optimize the properties of the layer (i.e. the relative conductivity/insulating behavior), the Examiner deems it would have been obvious to one of ordinary skill in the art to utilize a current limiting layer meeting applicants' claimed structure and location inorder to better control the behavior of the "pin hole"-filled layer.

9. Claims 19 – 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. as applied above in Paragraphs 5 – 7 for the reasons of record as set forth in Paragraph No. 17 of the Office Action mailed on February 7, 2005.

10. Claims 3, 4 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. as applied above in Paragraph 4, and further in view of Mack et al. (U.S. Patent No. 6,462,919 B1) for the reasons of record as set forth in Paragraph No. 18 of the Office Action mailed on February 7, 2005.

11. Claims 3, 4 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. in view of Sugawara, Sugawara and Fujiwara et al. as applied above in Paragraph 8, and further in view of Mack et al. ('919 B1).

Kamiguchi et al., Sugawara '039 B2, Sugawara '008 A1, and Fujiwara et al. are relied upon as described above.

None of the above disclose bias elements meeting applicants' claimed limitations.

However, Mack et al. teach that it is old in the art to provide bias elements meeting applicants' claimed limitations inorder to bias the edges of the free magnetic layer to reduce the generation of noise via domain wall movement (*Figure 6A, col. 2, lines 15 – 24 and lines 48 – 56; col. 4, line 22 bridging col. 5, line 11; and col. 8, lines 34 – 64*).

It would therefore have been obvious to one of ordinary skill in the art at the time of applicants' invention to modify the device of Kamiguchi et al. to use bias elements meeting applicants' claimed limitations as taught by Mack et al. inorder to bias the edges of the free magnetic layer to reduce the generation of noise via domain wall movement.

12. Claims 5, 6 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. as applied above in Paragraph 4, and further in view of Kishi et al. (U.S. Patent App. No. 2002/0191451 A1) for the reasons of record as set forth in Paragraph No. 19 of the Office Action mailed on February 7, 2005.

13. Claims 5, 6 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamiguchi et al. in view of Sugawara, Sugawara and Fujiwara et al. as applied above in Paragraph 8, and further in view of Kishi et al. ('451 A1).

Kamiguchi et al., Sugawara '039 B2, Sugawara '008 A1, and Fujiwara et al. are relied upon as described above.

None of the above disclose the plurality of magnetic layers making up the free magnetic layer being ferromagnetically coupled to each other (i.e. the magnetizations being parallel to each other).

However, the Examiner deems that multilayered free layers that are AP coupled and multilayered free layers that are FM coupled are known equivalents in the field of multilayered free layers for use in MR sensing elements, as taught by Kishi et al. (*Abstract*).

Substitution of equivalents requires no express motivation as long a the prior art recognizes the equivalency. In the instant case, AP coupling and FM coupling are equivalents in the field of multilayered free layers.

Response to Arguments

14. The Double Patenting rejection of claims 13, 19 – 22 and 34 in view of US 6,707,649 B2

The above noted rejection has been withdrawn because applicant(s) have filed a proper terminal disclaimer disclaiming the subject matter of US '649 B2.

15. The rejection of claims 1 – 16, 19 – 22, 24 – 30, and 34 – 42 under 35 U.S.C § 102(a), (b), (e) and/or 103(a) – Kamiguchi et al. , alone or in view of Mack et al. or Kishi et al.

Applicant(s) argue(s) that Kamiguchi et al. "fails to teach or disclose the claimed feature of a current flowing perpendicularly to the film plane of each layer of the multilayer film" (*pages 10 – 11 of response*). The examiner respectfully disagrees.

As noted in the rejection of record, Kamiguchi et al. disclose the claimed limitation at col. 28, lines 27 – 43 (*"distribution of a current flowing in the spin valve film in the thickness direction of the film must be designed appropriately"*). The Examiner notes that the "thickness direction" *is* perpendicular to the film plane of the layers.

Applicants further argue that Kamiguchi et al. only disclose forming the current limiting layer between pinned magnetic layers (*page 11 of response*). The Examiner respectfully disagrees.

While the specific embodiment disclosing the pin hole structure may be an embodiment discussing a current limiting layer between pinned magnetic layers, the Examiner notes that Kamiguchi et al. clearly teach that such a layer structure can be

located between free magnetic layers (*col. 13, line 51 bridging col. 14, line 6*). The Examiner notes that the "crystal growth controlling layer" (*col. 7, lines 8 – 21*), the "K-layer" (*col. 14, lines 3 – 5*), the "diffusion preventing layer" (*col. 21, lines 20 – 67*) and the "electron reflecting layer" (*col. 22, lines 1 – 6 and col. 26, lines 30 – 40*) are all equivalent names that Kamiguchi et al. gives to their oxide, nitride, carbide, boride, fluoride, etc. layer. As such, the Examiner deems that there is sufficient disclosure in Kamiguchi et al. to correlate the section talking about forming the "electron reflecting" oxide, nitride, etc. layer as a discontinuous layer and the oxide, nitride, etc. "K-layer" disclosed as being used between adjacent free layers. Applicant(s) are reminded that the rejection is based on the entire reference(s) and not just a piece meal analysis of the cited reference(s).

Finally, with regard to applicants' argument regarding the holes being filled with the conductive material, the Examiner has addressed this issue in more detail in the present rejection of record.

16. The rejection of claims 1 – 16, 19 – 22, 24 – 30, and 34 – 42 under 35 U.S.C § 103(a) – Kamiguchi et al. in view of Sugawara, Sugawara, and Fujiwara et al., alone or in view of Mack et al. or Kishi et al.

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

17. The rejection of claims 1, 5 – 7, 9, 11, 13, 15, 16, 19 - 22, 24, 25, 27, 29, 34 and 39 - 41 under 35 U.S.C § 102(a), (e), (f) and/or 103(a) – Hasegawa et al. (various references)

Applicant(s) argue(s) that "Hasegawa et al. fails to teach or suggest the claimed arrangement of the current limiting layer as being disposed in a laminated free magnetic layer" (*page 12 of response*). The examiner respectfully disagrees.

The Examiner directs applicants to the detailed description of why the Examiner deems that the disclosed structure of Hasegawa et al. reads on the claimed structure (see pages 9 and 10, especially Table 2, of the Office Action mailed February 7, 2005). The Examiner believes that applicants are giving the limitation "the free magnetic layer comprises a plurality of magnetic layers" a more narrow definition than what the Examiner deems is proper. Specifically, the Examiner deems that the *magnetic* bias layer in Hasegawa et al. embodiment A (*from Table 2 mentioned above*) falls within the scope of "the free magnetic layer comprises a plurality of magnetic layers". I.e. for the purpose of the claim limitation, the "free magnetic layer" of Hasegawa et al. embodiment A in Table 2 includes 5 layers: Free magnetic layer/AF coupling layer/Free magnetic layer/Cur. Lim. Layer/Mag. Bias layer. The Examiner suggests including additional limitations to better distinguish the "free layer" from the "magnetic bias layer" should applicants wish to exclude the magnetic bias layer from reading on the claimed limitations.

Conclusion

18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Kevin M. Bernatz, PhD
Primary Examiner

KMB
August 4, 2005